

NEW SPECIES OF FRANKLINIELLA
(THYSANOPTERA).

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The grouping of individuals into the human invention known as species becomes in this genus a feat of extraordinary difficulty. In the course of their evolution certain groups into which the genus is divisible have become tolerably distinct, but within several of these groups the differentiation of species seems to be nearly, if not quite, impossible. The small size of the insects no doubt facilitates their dispersal and probably reduces the effectiveness of most of the natural barriers, permitting interbreeding among closely related forms and preventing the crystallization of specific differences.

At any rate, we find that specimens from the tropics of the New World may usually be separated readily into species if little material is at hand; but with the increase in the number of individuals available for study comes the almost complete connection of some of these forms by slight variations in color and structure. For example, the number of bristles on the wing veins might be regarded at first as a distinct structural character for the definition of species; but in many cases we find that the bristles vary in number directly as the size of the wing, whether the difference in size be between individuals of the same or different species.

Furthermore, in nearly every large series, even when taken from a single plant, will be found a few specimens of smaller or larger size, or of paler or darker coloration; and with these differences in size or color will be associated more or less definite structural characters, such as the relative length and stoutness of the bristles and minor variations in the form of the antennal segments and other body parts. Such individuals cannot be considered distinct species, being evidently either mutants or ecological forms of the species with which taken.

In some cases, though, several apparently valid species have been found within a single flower. There is probably some interbreeding at such times between forms which, though closely related, we have every reason to consider distinct, and some of the puzzling intergrades may have been so produced. In the absence of definite, experimental evidence to the contrary, however, we must continue to recognize such forms as worthy of separate names.

An appalling amount of breeding work must be done by the entomologists of the future before we shall know the proper status of the various groups of individuals now known as species. The systematic worker is perhaps to be forgiven if, at times, he feels discouraged in his attempts to fit a rigid nomenclature to any group of living things which, by the very nature of their origin can never be neatly pigeon-holed, knowing as he does that his work, no matter how carefully and conscientiously performed or upon what wealth of material based, must eventually be overhauled to its very foundations.

It will be noticed that the species here described are distributed among four major divisions of the genus which are separated in part on the structure of the pedicel of the third antennal segment. This character has not heretofore been used in diagnosing species but is one which, notwithstanding its minuteness, has been found most satisfactory in the definition of Groups *tritici* and *cephalica*, below. It is interesting to note that *F. tritici* (Fitch) and *F. occidentalis* (Pergande), said by some authors to be inseparable from each other, fall into different groups, the character of the pedicel providing a ready and gratifying means for their separation.

The prolongation of the second antennal segment at its apex is a second valuable character. It occurs in *F. cephalica* (Crawford)¹ (= *Euthrips tritici* var. *bispinosus* Morgan,¹ = *Euthrips tritici* var. *projectus* Watson¹) and a few of its closest relatives. Without some experience it may be difficult to detect this prolongation in dorsal view, though it is quite evident when seen from the side. Notwithstanding this disadvantage, it is apparently an adequate character for the definition of a subordinate group of species (Group *cephalica*, below) which is closely related in the form of the pedicel of the third antennal segment to the *tritici* group.

A third useful structure is found in the armature of the ninth abdominal tergite of the male. This character appears first to have been used by the present writer in the differentiation of *F. williamsi* (Ins. Insc. Menstr., Vol. III, 1915, p. 21) and has subsequently been adopted by Bagnall in the separation of *gemina*, *distinguenda*, *melanommata*, etc. In the present instance it has proved most useful in the definition of *difficilis* and *cubensis*.

It might be remarked that, of the four groups recognized, the

¹ Authentic material (usually cotypic or paratypic) is before me.

first, second, and fourth occur only in the Americas, in so far as known. The third group is very much the largest, embracing all of the European and African species studied—although the definition of that group in respect to wing coloration, at least, will doubtless require some modification.

In addition to the synonyms given above for *F. cephalica* (Crawford), it might be pointed out that the name *F. tenuicornis* (Uzel)¹ should be used for the species which Hinds¹ called *Euthrips nervosus* (Uzel). *Thrips (Euthrips) maidis* Beach¹ is the same insect.

I must acknowledge my very deep obligations to the following entomologists and zoologists who have supplied most of the many thousands of specimens of this genus which have been examined: J. W. Bailey, G. E. Bodkin, L. C. Bragg, Patricio Cardín, Bert R. Coad, R. A. Cooley, Charles A. Hart, M. M. High, W. A. Hooker, L. O. Jackson, E. R. Kalmbach, W. L. McAtee, H. K. Plank, H. M. Russell, E. W. Rust, James Silver, Jr., Alexander Wetmore, C. B. Williams, and James Zetek.

The types are in the author's collection.

Genus *Frankliniella* Karny.

I.—Interocellar bristles distinct, decidedly (often many times) longer than diameter of ocelli; pedicel of third antennal segment with an abrupt, subbasal thickening which, in profile, usually appears as an angulation on either side of the pedicel (Pl. III, figs. 1, 3, 5, 7);² second antennal segment not thickened on dorsum at apex nor prolonged, the two bristles there situated not short and thickened . . . Group *tritici*.

Frankliniella difficilis sp. nov. (Pl. III, figs. 1 and 2.)

Female (macropterous).—Length about 1.4 mm. Color pale yellow (nearly white); antennae with distal half of segment 4 and all of 6–8 gray brown, 2 often darkened apically, 1 nearly colorless; ocellar pigment bright red; wings faintly yellowish; all bristles brown. The four pairs of major pronotal bristles subequal, nearly half the length of pronotum and only slightly longer than interocellars. Length of antennal segments in microns: 1, 30; 2, 44; 3, 59; 4, 49; 5, 36; 6, 46; 7, 9; 8, 13.

² The only figure of this structure in the literature is that given by Williams, *Journ. Econ. Biol.*, Vol. 8, 1913, p. 214, fig. 2, c.

Male (macropterous).—Smaller, slenderer, and somewhat less yellowish than female. Tergite 9 with a pair of short, approximate, rather stout bristles behind middle, and a pair of somewhat *shorter* and more slender bristles external and anterior to these; macrochaetae at sides of tergites 9 and 10 particularly heavy and dark.

Guadeloupe and Martinique, French West Indies; in various flowers, by sweeping, etc.; C. B. Williams.

Evidently closely related to *F. tritici* (Fitch), but separable by the paler coloration, longer anterior marginal bristles, much longer antennal style, and, especially, the differently armed penultimate abdominal tergite of the male. This last character distinguishes it readily from *gemina* and *distinguenda*, while the long anterior-marginal bristles exclude it from *cephalica* and *melanommatata*, all of which agree with *difficilis* in coloration though they do not belong to the same group.

II.—Like I, except that the second antennal segment is thickened on dorsum at apex and slightly produced, and bears two rather prominent, somewhat thickened bristles (Pl. I, fig. 7)³ Group *cephalica*.
a.—Color pale yellow.

Frankliniella cubensis sp. nov. (Pl. III, fig. 3.)

Female (macropterous).—Length about 1.1 mm. Color pale yellow (nearly white); antennae with distal half of segment 4 and all of 6–8 gray-brown, 2 darkened apically, 1 nearly colorless; ocellar pigment bright red; wings colorless; all bristles pale brown. The four pairs of pronotal bristles subequal, about half the length of pronotum; inter-ocellars distinctly shorter. Length of antennal segments in microns: 1, 26; 2, 40; 3, 52; 4, 43; 5, 36; 6, 43; 7, 6; 8, 12.

Male (macropterous).—Smaller, slenderer, and somewhat less yellowish than female. Tergite 9 with a pair of short, approximate, rather stout bristles behind middle, and a pair of somewhat *shorter* and more slender bristles external and anterior to these; macrochaetae at sides of tergites 9 and 10 light brown, short and moderately stout.

³ For other illustrations of this structure see Crawford, Pomona Coll. Journ. Ent., Vol. II, 1910, No. 1, p. 154, fig. 63, B, and Williams, *l. c.*

Cuba; in flowers of citrus and *Carissa acuminata*; Patricio Cardin.

Related intimately to *cephalica* and *melanommata*, but easily known in the male by the armature of the ninth abdominal tergite, and in the female by the long anterior marginal bristles. *Cubensis* has the pedicel of segment 5 of the antennae unusually narrow at the base.

aa.—Color brown; pronotal bristles subequal, half as long as pronotum, very slightly, if at all, longer than interocellars.

Frankliniella zeteki sp. nov. (Pl. III, fig. 5.)

Female (macropterous).—Length about 1.1 mm. Color light brown, apex of abdomen darkest; femora brown, yellow at base and apex, the fore pair yellow along inner surface also; tibiae and tarsi yellow, hind tibiae brown across middle; antennae with segments 1, 2, and 4–8 brown, 2 darkest, 3 brownish yellow, 4 and 5 paler basally; wings nearly uniform pale brown; ocellar pigment red. Head 1.5–1.9 times as wide as long; segment 3 of antennae with pedicel less than twice as long as greatest width; length of antennal segments in microns: 1, 24; 2, 36; 3, 64; 4, 51; 5, 39; 6, 51; 7, 10; 8, 17.

Chepigana (Darien), Panama; James Zetek; no data on habitat, though almost certainly from flowers.

The closest relative of this species is *parvula*, a very common Neotropical form with which it agrees in all respects, apparently, excepting the much shorter third antennal segment with its shorter and stouter pedicel, the decidedly shorter head, the stouter and more prominent postocular bristles, and the average darker color of the antennae.

Named after my good friend, Mr. James Zetek, who collected it.

Frankliniella parvula Hood. (Pl. III, fig. 7.)

This name is inserted here to facilitate reference to the figure of the antenna given on the accompanying plate.

III.—Interocellar bristles distinct, decidedly longer than diameter of ocelli; second antennal segment normal; pedicel of third antennal segment without abrupt subbasal thickening (Pl. III, figs. 6, 8, 9, 10); wings, when not pale, either dark brown and distinctly paler at base or uniformly and lightly

washed with brownish or grayish, never uniform dark brown in color Group *intonsa*.

a.—Antennae of normal form, not noticeably short and stout; segments 7 and 8 together about one-half as long as segment 6; 8 long and cylindrical (Pl. III, fig. 11.)

b.—Antero-marginal bristles half as long as pronotum and subequal to those at posterior angles.

c.—Color brown; interval between posterior ocelli three times their diameter.

Frankliniella panamensis sp. nov. (Pl. III, fig. 8.)

Female (macropterous).—Length about 1.4 mm. Color brown, shading from yellowish brown in head to blackish brown at tip of abdomen; pterothorax with bright orange-red hypodermal pigmentation; antennae rather uniformly brown, the basal half or more of segment 3, basal third of 4, and usually an indistinct ring just beyond pedicel of 5, yellowish; legs paler than body, tibiae and tarsi yellow, the former more or less shaded with brown; forewings distinctly darkened with brown, uniform in color; ocellar pigment orange-red. Head about one and one-fourth times as wide as long, with a narrow black line along extreme posterior margin; interval between posterior ocelli three times their diameter; interocellar bristles nearly half as long as pronotum, only slightly shorter than antero-marginals. Wings long, with about 29, 23, and 18 bristles on costa, anterior vein, and posterior vein, respectively. Antennae slender, intermediate segments elongated, 3 fully three times as long as wide, 8 long and slender; length of antennal segments in microns: 1, 32; 2, 48; 3, 72; 4, 60; 5, 46; 6, 56; 7, 10; 8, 16.

Boquete, Panama, February 28 and March 3, 1914; in flowers; James Zetek.

Close to *occidentalis*, but apparently distinct enough to require a separate name. Recognizable by the more slender antennae, larger pronotal and interocellar bristles, and the longer and much darker wings.

cc.—Color yellow; interval between posterior ocelli twice their diameter.

Frankliniella ameliae sp. nov. (Pl. III, fig. 6.)

Female (macropterous).—Length about 1.3 mm. Color lemon yellow, pterothorax tinged with orange, abdominal tergites with a gray blotch at middle; legs concolorous with body; antennae with segment 1 and bases of 3, 4, and 5 yellow, remainder dark brown; wings uniform pale brown; all body and wing bristles brown. Head narrowed basally, about 1.2 times as wide as long, without dark line at base; interocellar bristles distinctly less than half as long as pronotum, much shorter than antero-marginals. Wings rather long, with about 23, 19, and 15 bristles on costa, anterior vein, and posterior vein, respectively. Antennae moderately slender; segment 3 three times as long as wide, 8 long and slender; length of antennal segments in microns: 1, 30; 2, 42; 3, 51; 4, 47; 5, 40; 6, 53; 7, 10; 8, 16.

Male (macropterous).—Smaller, slenderer, and somewhat less yellowish than female. Tergite 9 with a pair of rather short but slender, approximate bristles near posterior margin, and a pair of bristles, twice as long and somewhat stouter, external to them and on the same transverse line; macrochaetae at sides of tergites 9 and 10 dark brown, short and moderately stout.

Boquete, Panama, February 28 and 29, 1914; in flowers; James Zetek.

Perhaps closest to *williamsi*, but separable in the female by the darker colored bristles and wings, the orange tinted pterothorax, the presence of abdominal brown blotches, the more approximate posterior ocelli, and the very differently colored antennae. The male has the ninth abdominal tergite of much the same structure as that of *williamsi*, but the median pair of bristles are longer and slenderer, and the macrochaetae at the sides of the tergites are very much longer, stouter, and darker.

bb.—Antero-marginal bristles very small, not more than one-fourth as long as pronotum, hardly half as long as bristles at posterior angles.

c.—All bristles pale yellowish, slender and inconspicuous, postoculars short, subequal to antero-marginals, less than half as long as those at posterior angles of pronotum; segment 7 of antennae

very little, if at all, more than half as long as 8; abdomen with a very delicate, sparse comb on posterior margin of tergite 8.

Frankliniella exigua sp. nov. (Pl. III, fig. 9.)

Female (macropterous).—Length about 1.0 mm. Color nearly uniform pale yellow, legs somewhat paler than body, wings clear; antennae with segment 1 nearly colorless, 2 lightly brownish, 3–5 about concolorous with head, infusate apically, 6–8 brown-gray, 6 paler at base; ocellar pigment orange. Head about 1.2 times as wide as long; interocellar and postocular bristles slender, inconspicuous, and nearly colorless, the postoculars subequal to antero-marginals; eyes small, about as long as their distance from posterior margin of head. Prothoracic bristles short, those at posterior angles longest but less than half the length of pronotum. Fore wings with about 23, 17, and 13 bristles on costa, anterior vein, and posterior vein, respectively. Antennae moderately slender; stylus long, the eighth segment quite slender and nearly twice as long as 7; measurements of antennal segments in microns: 1, 24; 2, 31; 3, 42; 4, 38; 5, 31; 6, 44; 7, 7; 8, 14.

Grant, Colorado, July 24, 1916; sweeping; L. O. Jackson.

F. helianthi (Moulton) and *F. gossypii* (Morgan) are the only North American species with which this slender little form seems comparable. In *helianthi*, however, the body bristles are described as "large, brown, and conspicuous"; while *gossypii* has the antero-marginal bristles well developed. *Exigua* is suggestive of the Neotropical *distinguenda*, which, however, has the terminal antennal segment much shorter.

cc.—All major bristles brown, moderately stout, and conspicuous; postoculars minute (Pl. III, fig. 4), pale, hardly half as long as the much darker and heavier antero-marginals, which themselves are not nearly half as long as those at the posterior angles of pronotum; segment 7 of antennae decidedly more than half as long as 8; abdomen without trace of comb on posterior margin of tergite 8.

Frankliniella genuina sp. nov. (Pl. III, fig. 4.)

Female (macropterous).—Length about 1.1 mm. Color pale yellow, thorax obscurely mottled with brown, usually darker in last two or three segments with a large, irregular, brown blotch on each tergite; wings nearly clear; legs concolorous with body, lightly shaded along outer surface with pale brown; antennae with segment 1 nearly clear; 2 yellow, darkened with brown; 3–5 yellow at base, successively slightly darker, shaded apically with brown; 6–8 blackish brown. Head about 1.2 times as wide as long; interocellar bristles decidedly longer than antero-marginals, rather stout, dark and conspicuous; eyes much longer than their distance from posterior margin of head. Prothoracic bristles short, stout, dark brown, less than half the length of pronotum, the inner of the two pairs at posterior angles longest. Fore wings with about 23, 17, and 13 bristles on costa, anterior vein, and posterior vein, respectively. Antennae moderately slender; stylus long, the eighth segment quite slender but not twice as long as 7; measurements of antennal segments in microns: 1, 24; 2, 36; 3, 43; 4, 40; 5, 36; 6, 49; 7, 10; 8, 14.

Mission, Texas, June 26 and September 8, 1914; on *Echinochloa colona* and an unidentified plant ("Plant No. 9"); J. W. Bailey.

The specific name of this form has reference to the most important character in the recognition of the species—the greatly reduced postocular bristles, which are minute and pale in marked contrast with the interocellar and antero-marginal pairs. This character separates it sharply (at least in the material before me) from *helianthi*, *gossypii*, and *exigua*, to which it is closely related.

aa.—Antennae short and stout; segments 7 and 8 together very much less than one-half as long as segment 6; 8 short and conical rather than cylindrical (Pl. III, fig. 10.)

Frankliniella bagnalliana sp. nov. (Pl. III, fig. 10.)

Female (macropterous).—Length about 1.1 mm. Color quite uniformly dark brown, somewhat darker posteriorly; femora nearly concolorous with body basally, apices yellow; tibiae and tarsi yellow, the former sometimes slightly clouded with brownish at middle; antennae with segments 1, 2, and 6–8 brown; 3 yellow, shaded lightly with brown apically; 4 and 5 successively darker and more heavily shaded with

brown, 5 at apex about concolorous with 6; fore wings brown, distinctly paler at base. Head about 1.2 times as wide as long; pronotal bristles subequal and a little less than one-half the length of pronotum, the antero-marginals slightly shorter than the others; fore wings densely pilose throughout, with about 27, 21, and 20 closely spaced bristles on costa, anterior vein, and posterior vein, respectively. Antennae stout, about twice as long as head, almost exactly as in *F. oxyura* Bagnall,⁴ except that the stylus is decidedly shorter; length of antennal segments in microns: 1, 24; 2, 34; 3, 46; 4, 40; 5, 28; 6, 40; 7, 7; 8, 9.

Boquete, Panama, February 28, 1914; in flower; James Zetek, [No. 210].

In much the same way that the following species serves to connect *Frankliniella* with *Taeniothrips*, the present species links the group in which it is here placed with the one which follows. The form and general structure of the body and the character of the antennae place it with *oxyura*, *achaeta*, *minuta*, etc., to which it is most closely related and where it really belongs; but the long interocellar and pronotal bristles and the coloration of the wings make it difficult to form a suitable definition for that group if it be placed there. In addition to the characters just mentioned, the short antennal style and closely bristled veins of the fore wings are distinctive.

This distinct and interesting little form is named after Mr. Richard S. Bagnall, of Newcastle-on-Tyne, England, whose work on the Thysanoptera is familiar to entomologists everywhere.

IV.—Interocellar bristles minute and inconspicuous, shorter than diameter of ocelli and barely visible (Pl. III, fig. 12); pedicel of third antennal segment without abrupt sub-basal thickening; wings dark, not distinctly paler at base; segments 3 and 4 of antennae not pale yellowish, segment 8 slender Group *minuta*.

a.—Sternite of segment 3 of abdomen of female without an elliptical pale area; posterior margin of pronotum with *one* pair of large bristles in addition to the two usual pairs at posterior angles; *antero-marginal bristles and those at the anterior angles of pronotum minute and hardly recognizable as macrochaetae*.

⁴ See Priesner's illustration of this species (= *F. minuta* var. *paraguayensis* Priesner) in Deutsch. Ent. Zeitschr., 1921, p. 189.

Frankliniella achaeta sp. nov. (Pl. III, figs. 11 and 12.)

Female (macropterous).—Length about 1.2 mm. Color dark brown, nearly black to the naked eye; legs concolorous with body, except fore tibiae and all tarsi, which are light brown or yellowish; antennae with segments 1, 2, and 5–8 concolorous with body, 4 paler, 3 decidedly paler and yellowish; fore wings uniform dark brown save for a small, pale spot just beyond scale. Head long, about 0.9 as long as wide; pronotum with distinct anastomosing lines of sculpture; fore wings densely pilose throughout and with 14 to 16 bristles on anterior vein, these bristles distantly spaced beyond middle of wing. Antennae of the usual form and structure found in this section of the genus,⁵ but with the intermediate segments somewhat more elongated; segment 8 particularly long and slender, three times as long as wide; length of antennal segments in microns: 1, 22; 2, 30; 3, 40; 4, 35; 5, 30; 6, 42; 7, 9; 8, 13.

Grant, Colorado, and "Colorado"; taken by sweeping; L. O. Jackson.

Allied to *oxyura*, *minuta*, etc., but differing widely from them and from all other described species of the genus by the greatly reduced bristles on the anterior margin, and at the anterior angles, of the pronotum. In this respect it violates our definition of the genus itself and furnishes a most interesting transitional form between *Frankliniella* and *Taeniothrips*, indicating the manner in which the latter genus might possibly have originated from a close relative of the former—by the reduction and loss of the various bristles on the pronotum and wings. There cannot be the slightest doubt that this species belongs in the genus to which I have assigned it, so close is the structure of all parts of its body to *minuta*, *oxyura*, and *tympanona*. A real convenience might be served, however, could it, without violence to a genetic classification, be assigned to *Taeniothrips* instead of *Frankliniella*.

⁵ The only accurate figure of a species of this group is given by Priesner, *Deutsch. Ent. Zeitschr.*, 1921, p. 189.

EXPLANATION OF PLATE III.

(J. D. H. del., camera lucida.)

- Fig. 1.—*Frankliniella difficilis* sp. nov. Segment 3 of left antenna, ♀, paratype.
- Fig. 2.—*Frankliniella difficilis*. Tergite 9 of abdomen, ♂, paratype.
- Fig. 3.—*Frankliniella cubensis* sp. nov. Segment 3 of right antenna, ♀, holotype.
- Fig. 4.—*Frankliniella genuina* sp. nov. Head, ♀, holotype.
- Fig. 5.—*Frankliniella zeteki* sp. nov. Segment 3 of left antenna, ♀, holotype.
- Fig. 6.—*Frankliniella amelie* sp. nov. Segment 3 of left antenna, ♀, paratype.
- Fig. 7.—*Frankliniella parvula* Hood. Segments 1–3 of antenna and a portion of head (seen from side), ♀, paratype.
- Fig. 8.—*Frankliniella panamensis* sp. nov. Segment 3 of left antenna, ♀, holotype.
- Fig. 9.—*Frankliniella exigua* sp. nov. Segment 3 of right antenna, ♀, holotype.
- Fig. 10.—*Frankliniella bagnalliana* sp. nov. Right antenna, ♀, holotype.
- Fig. 11.—*Frankliniella achæta* sp. nov. Segments 6–8 of right antenna, ♀, paratype.
- Fig. 12.—*Frankliniella achæta*. Head and prothorax, ♀, paratype. (Bristles on legs and between facets of eyes omitted.)